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Tajima et al.

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[45] **Date of Patent: Jul. 18, 1989**

[54] **SHEET FEEDING MECHANISM**

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[73] Assignee: **Fuji Photo Film Co., Ltd.,** Kanagawa, Japan

[21] Appl. No.: **53,907**

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[30] **Foreign Application Priority Data**

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Nov. 29, 1986 [JP] Japan 61-284476

[51] **Int. Cl.**[4] **B65H 3/08**
[52] **U.S. Cl.** **271/90;** 271/107
[58] **Field of Search** ..... 271/107, 102, 106, 103, 271/20, 211, 90, 132, 194, 95, 104, 105; 414/120, 121; 74/54, 99 A, 107, 99 R, 104, 110

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Assistant Examiner—Stephen B. Parker
Attorney, Agent, or Firm—Sughrue, Mion, Zinn, Macpeak & Seas

[57] **ABSTRACT**

A sheet feeding mechanism for feeding stacked sheets one by one from a sheet magazine includes a plurality of suction cups coupled to a vacuum suction device for attracting one sheet at a time, and an arm member on which the suction cups are securely mounted. At least one rotatable bearing is operatively coupled to the arm member and rollingly movable in a guide groove having at least one curved or bent guide opening. The bearing is movable by a slider in and along the guide opening to angularly move the arm member and hence the suction cups for thereby swaying and feeding a sheet held by the suction cups.

10 Claims, 7 Drawing Sheets

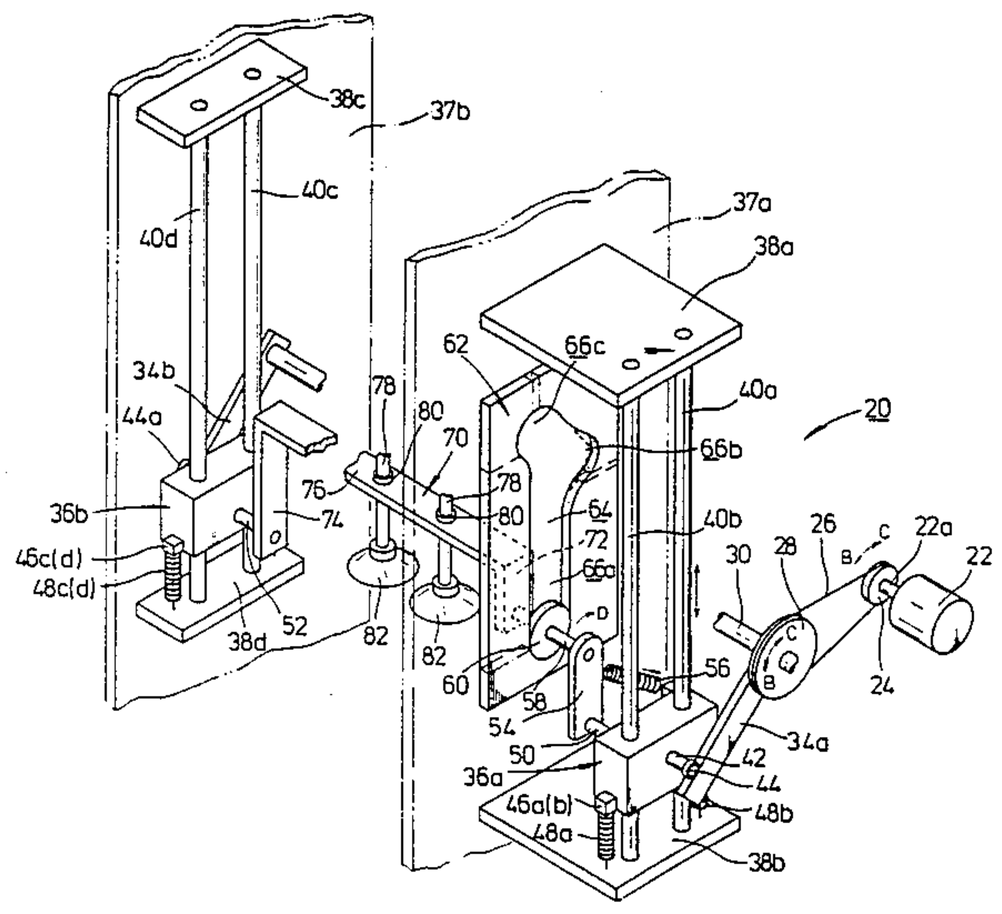


FIG.1

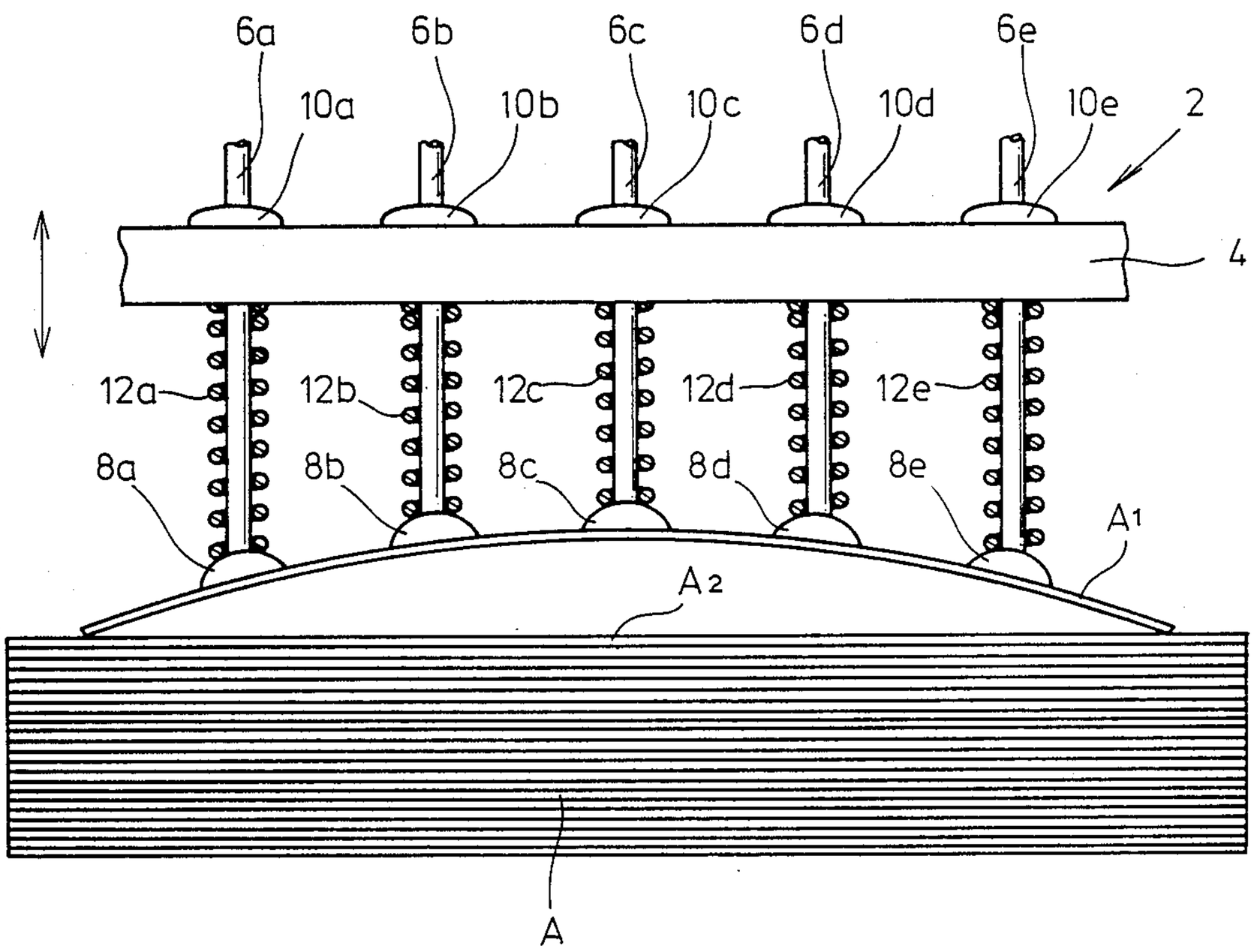

6a
6b
6c
6d
6e
10a
10b
10c
10d
10e
2
4
12a
12b
12c
12d
12e
8a
8b
8c
8d
8e
A1
A2
A

FIG. 2

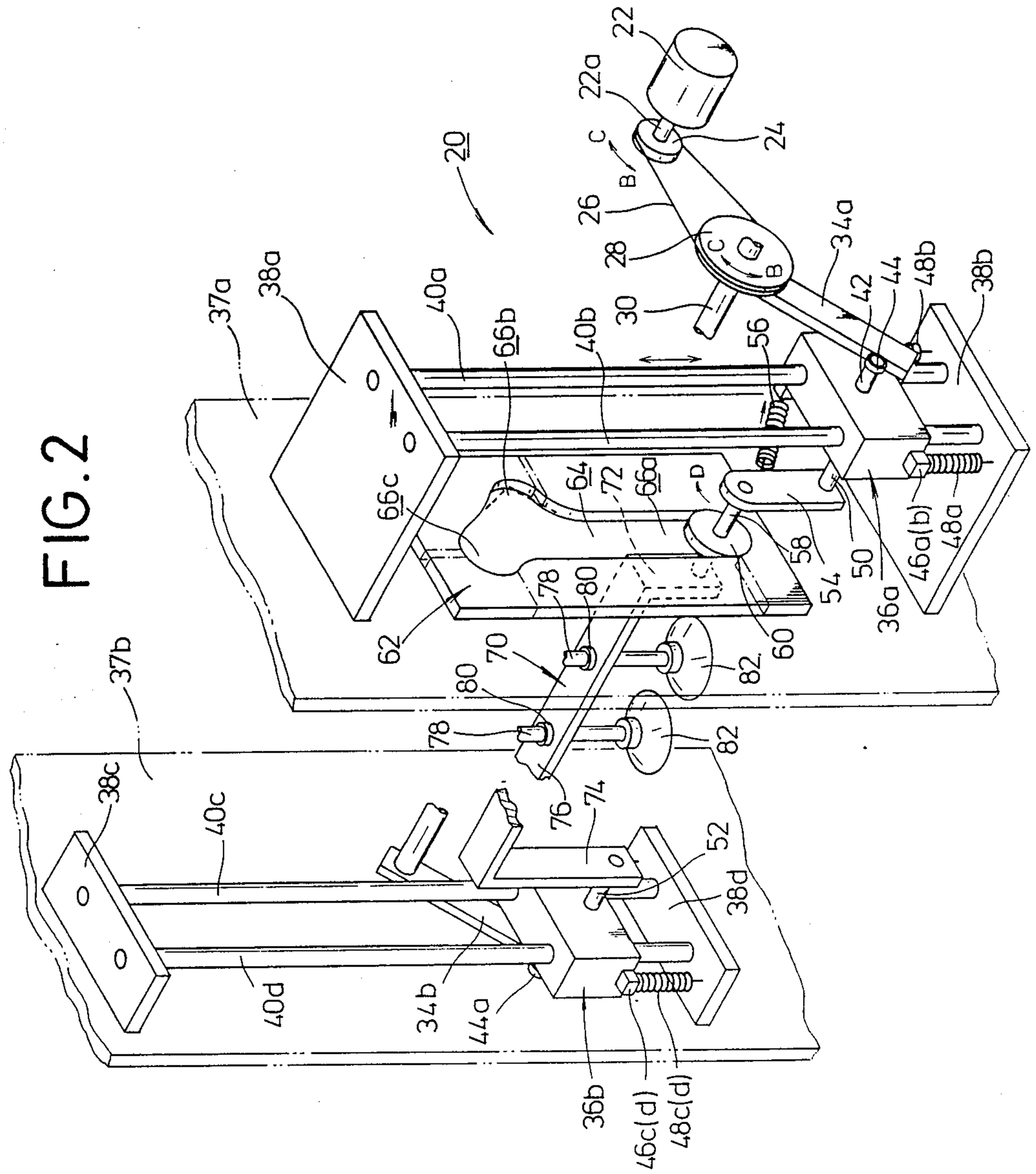

20
22
22a
24
26
28
30
34a
34b
36a
36b
37a
37b
38a
38b
38c
38d
40a
40b
40c
40d
42
44
46a(b)
46c(d)
48a
48b
48c(d)
50
52
54
56
58
60
62
64
66a
66b
66c
70
72
74
76
78
80
82

FIG.3 (c)

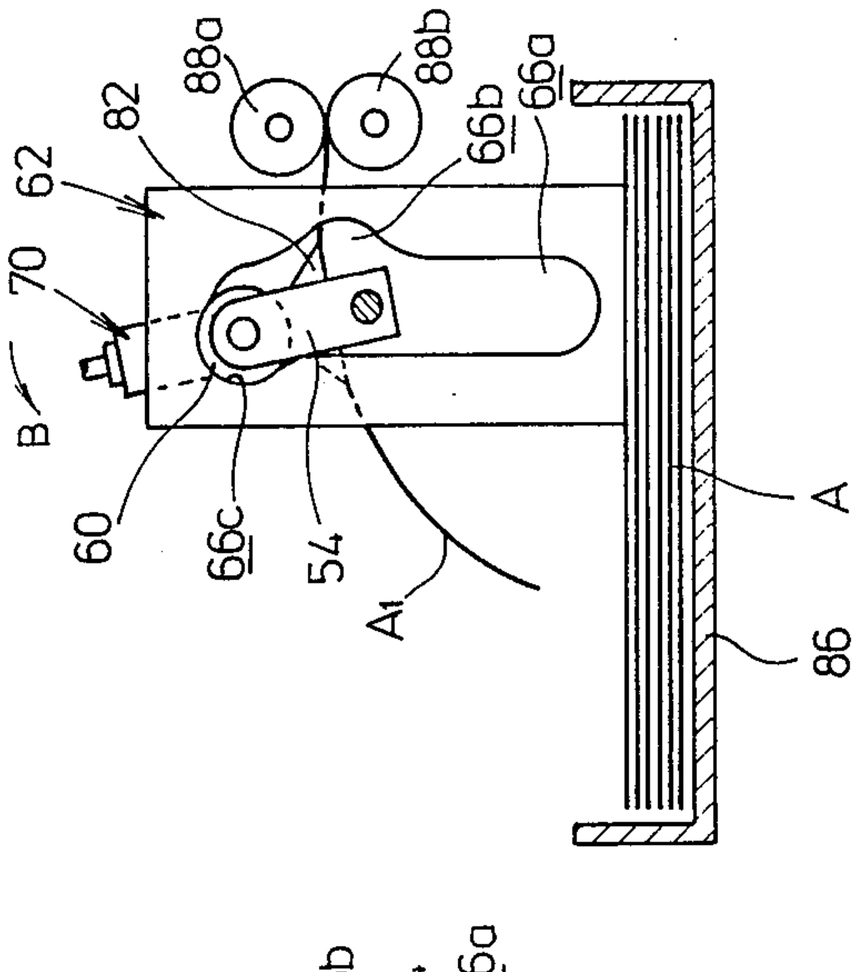


FIG.3 (b)

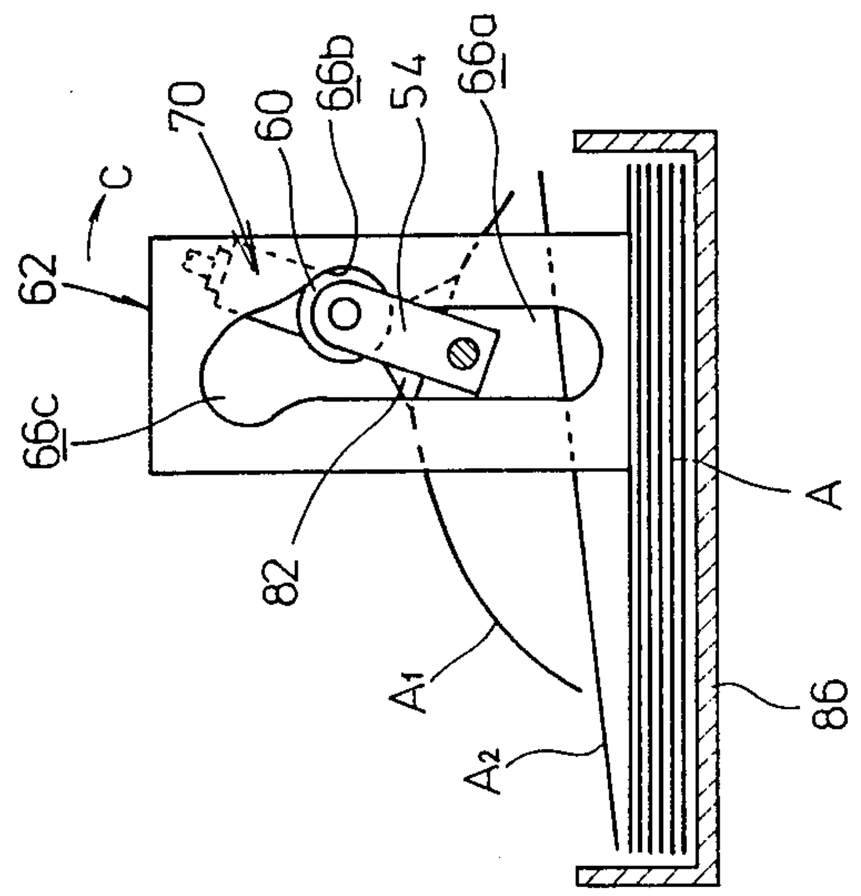
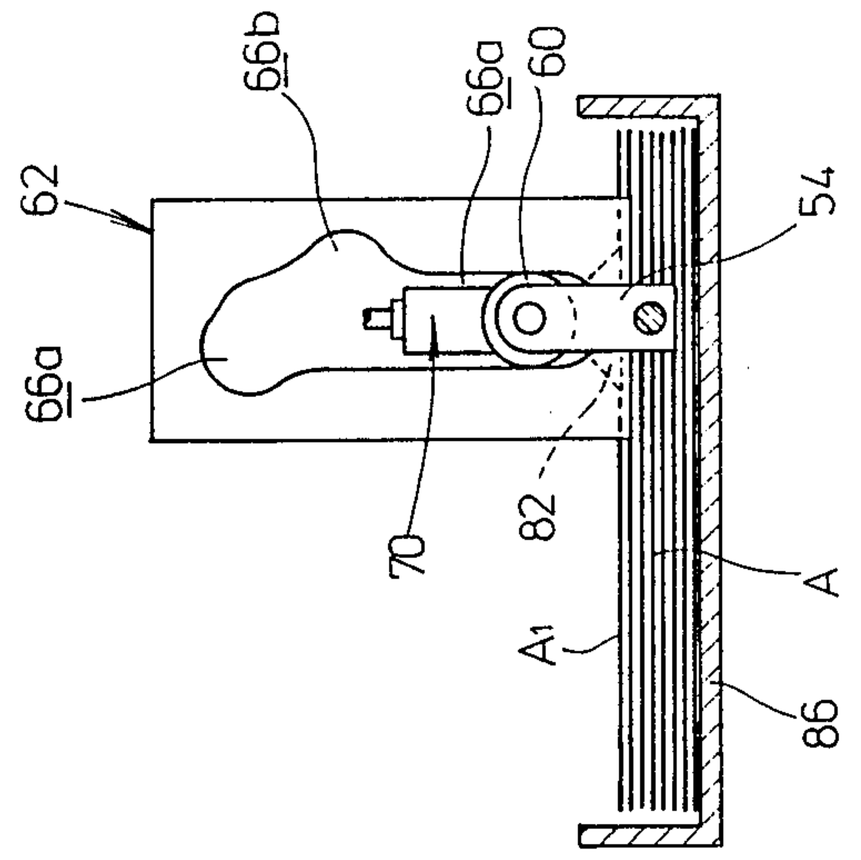


FIG.3 (a)



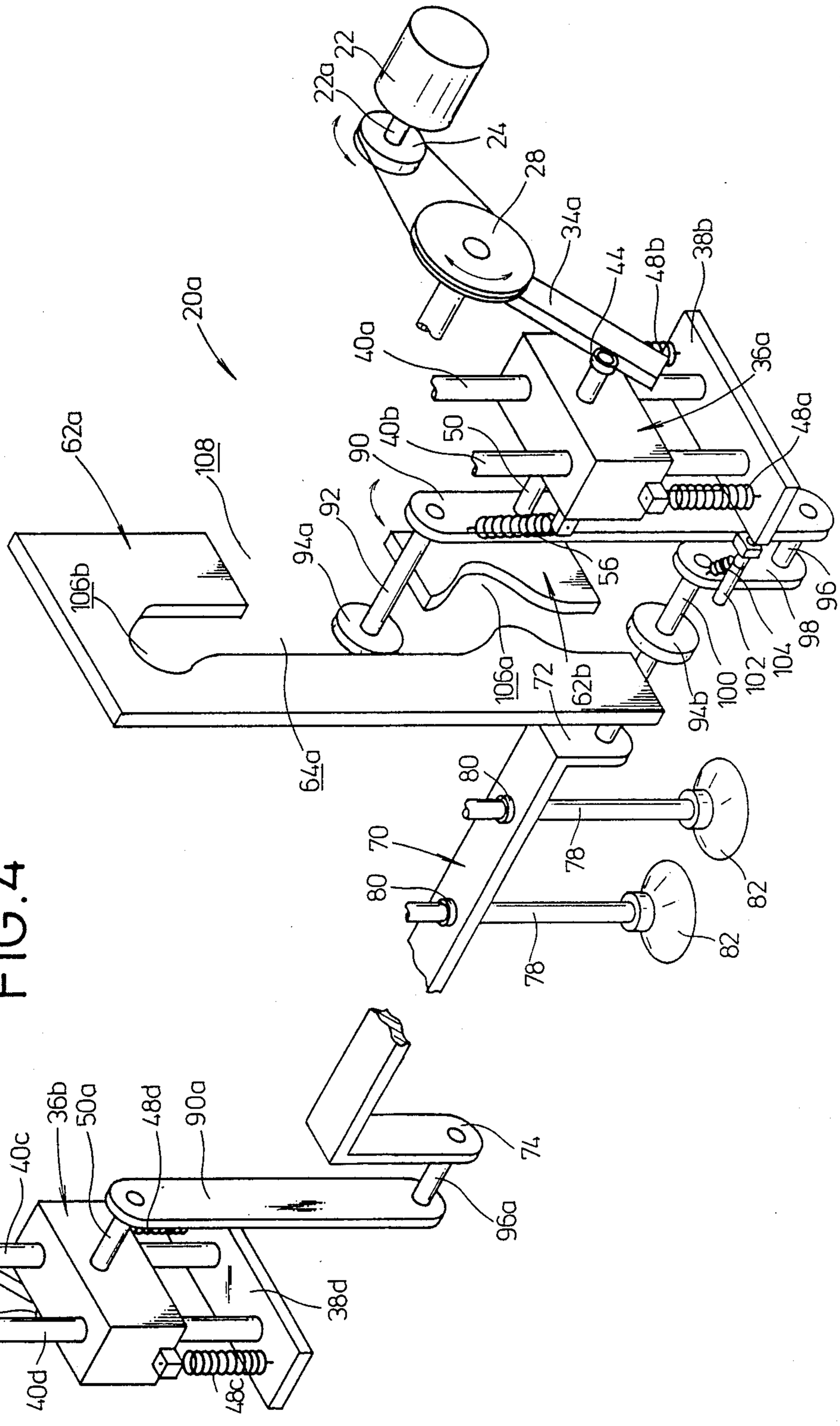

22a
22
24
28
34a
44
48b
38b
20a
40a
36a
62a
108
40b
50
90
48a
92
94a
56
106b
96
98
104
102
100
94b
106a
72
62b
64a
80
70
78
82
34b
40c
36b
50a
48d
90a
74
96a
44a
38d
40d
48c

FIG. 4

FIG.5
(b)

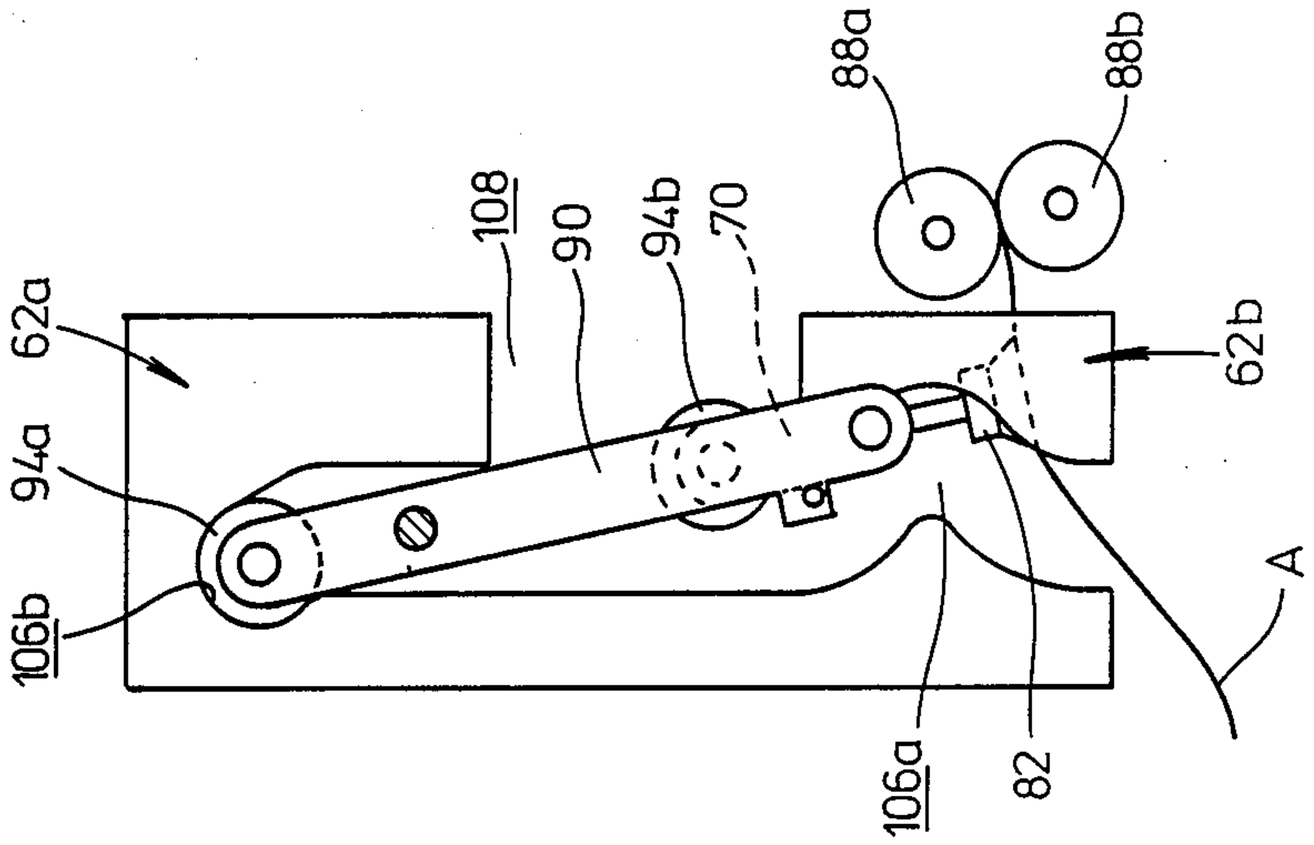
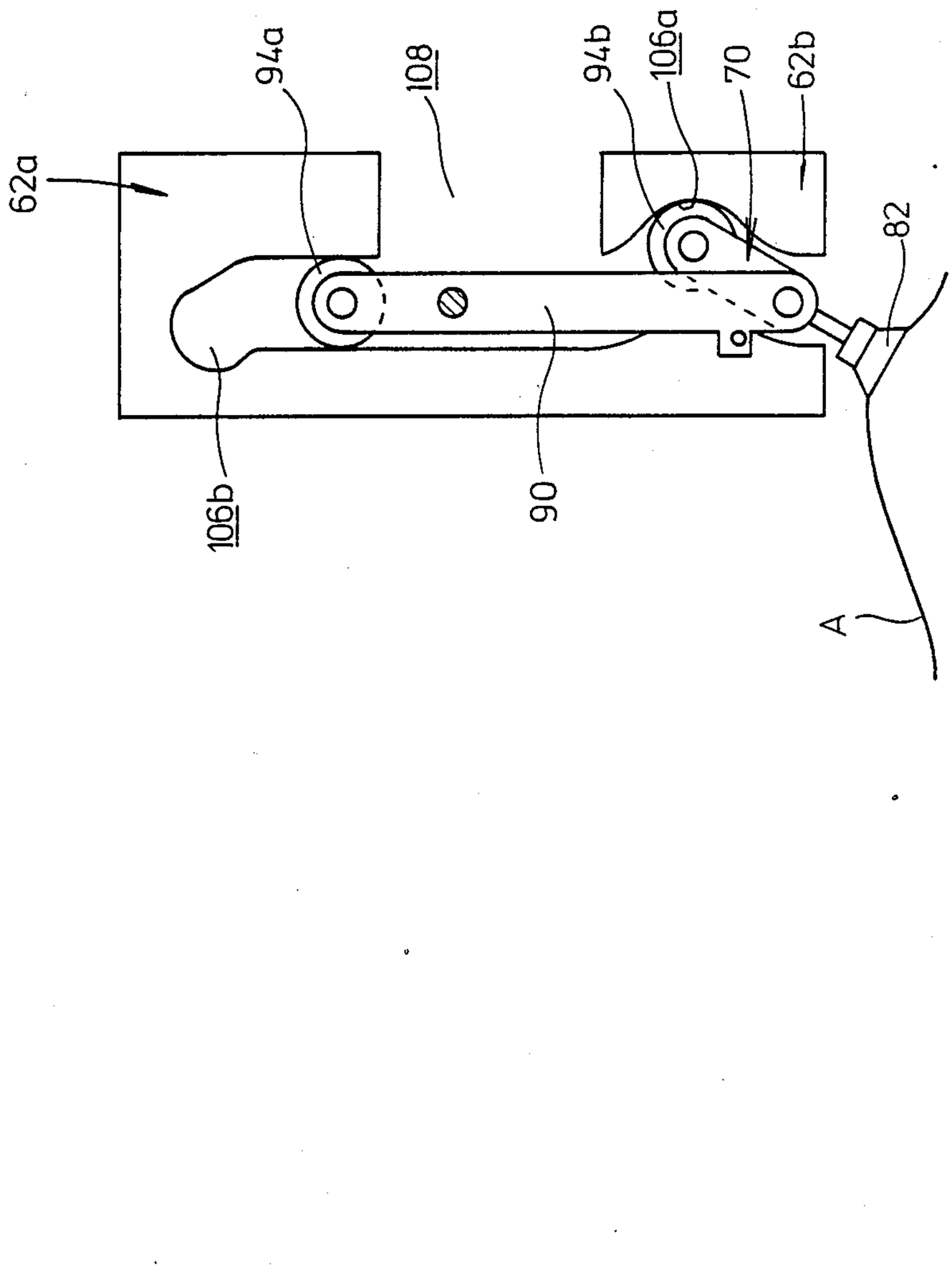
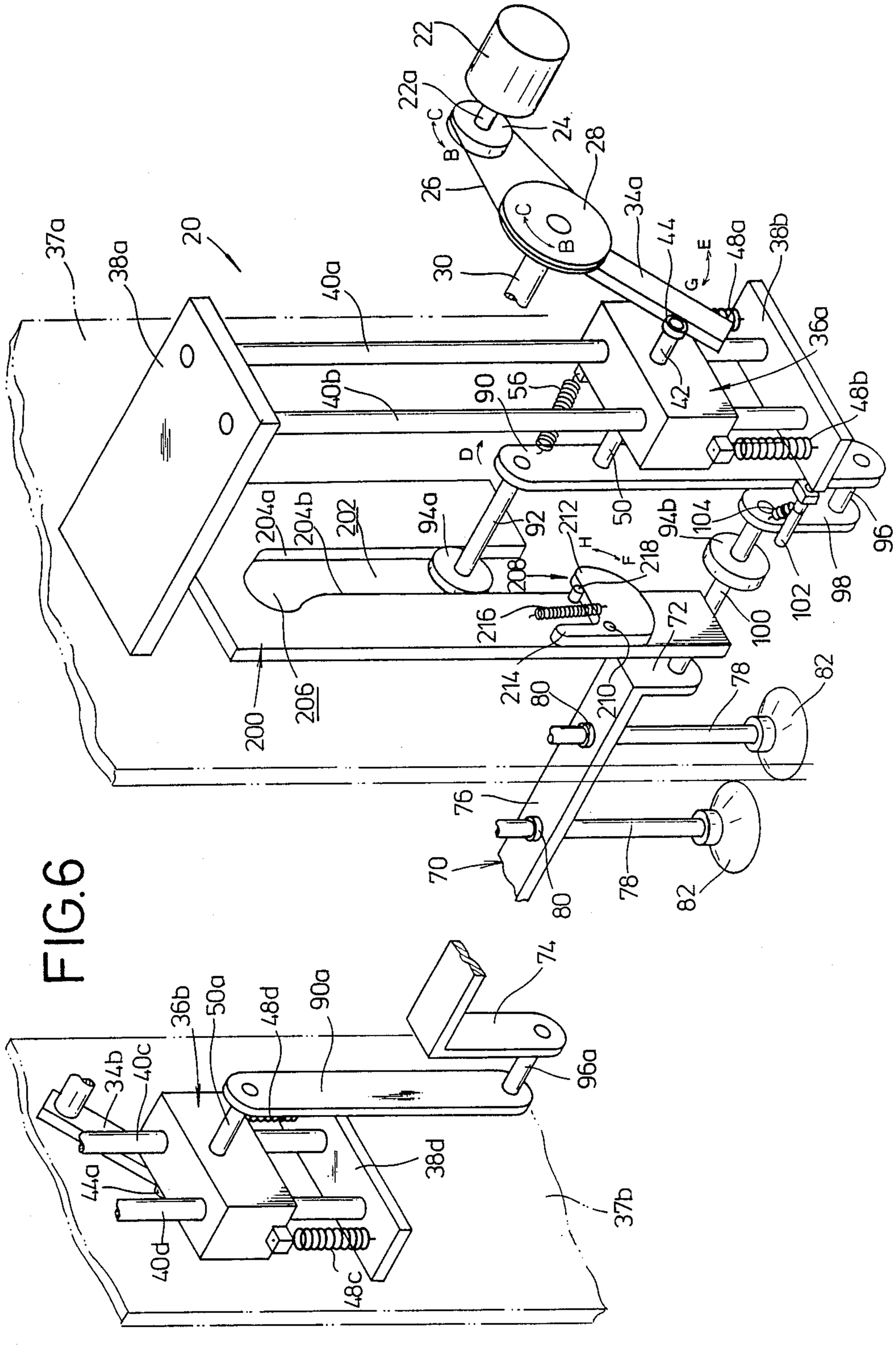

88a
88b
108
90
94b
70
62a
62b
94a
106b
A
106a
82

FIG.5
(a)


62a
94a
108
94b
106a
70
62b
82
106b
90
A


22
22a
C
B
24
28
26
34a
C
B
O
44
G
E
48a
38b
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37a
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20
40a
36a
O
40b
90
56
42
48b
D
O
50
204a
204b
202
94a
92
212
94b
104
H
F
218
208
216
72
100
102
98
96
200
206
214
80
210
78
82
76
70
80
78
82
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48d
90a
96a
34b
40c
38d
44a
40d
48c
37b

FIG.6

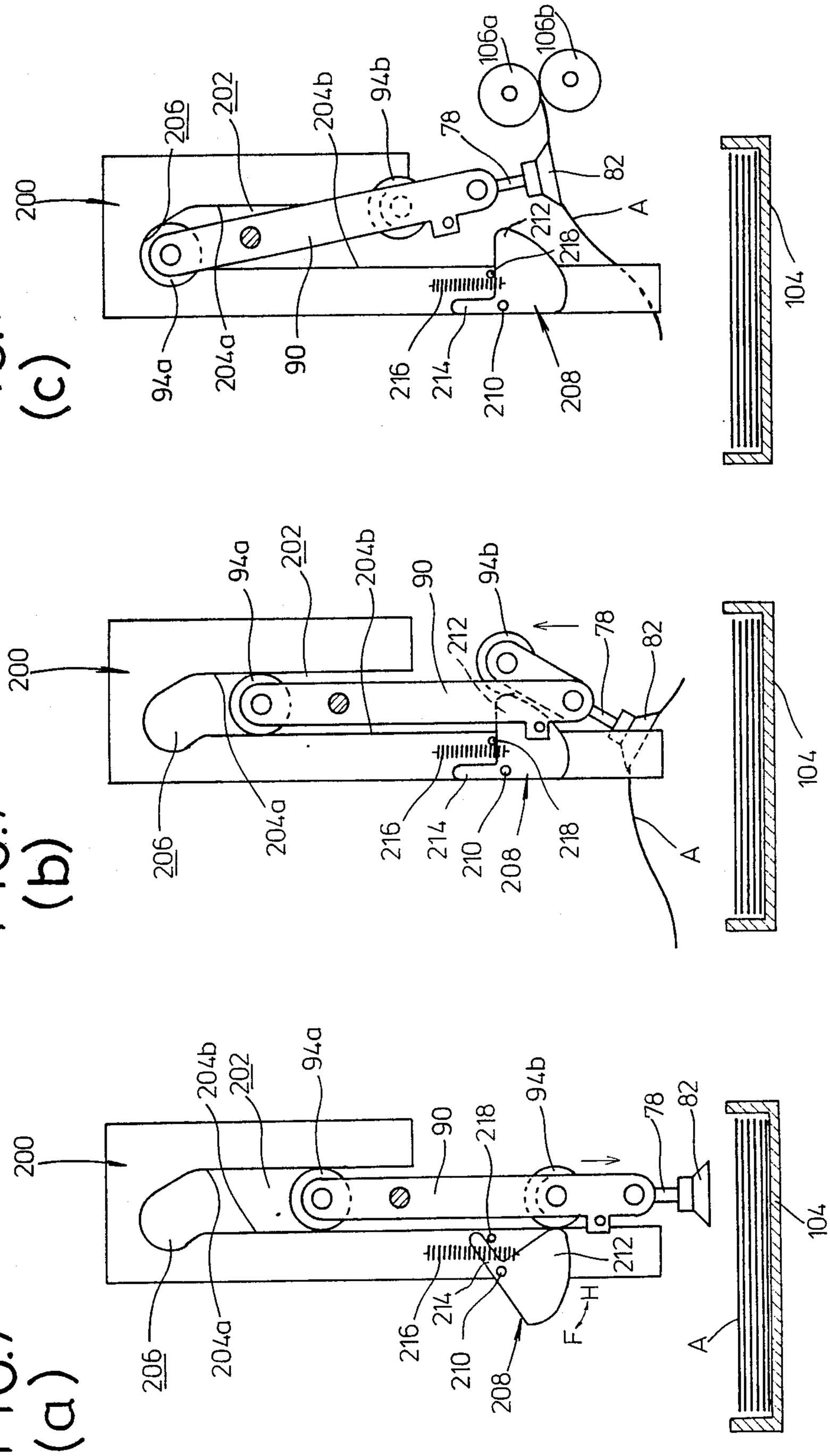

FIG.7
(a)

FIG.7
(b)

FIG.7
(c)

SHEET FEEDING MECHANISM

BACKGROUND OF THE INVENTION

The present invention relates a sheet feeding mechanism, and more particularly to a sheet feeding mechanism for reliably feeding sheets such as sheet films, one by one, from a stack of stored sheets.

Radiation image recording apparatuses are in general use for recording radiation images on photosensitive films through exposure to X-rays for subsequent use in medical diagnosis or the like. The photographic films are loaded in the radiation image recording apparatus under light-shielded conditions so that the films will not be exposed to extraneous light. The image of an object is recorded on a loaded photographic film by exposing the emulsion layer of the film directly to X-rays.

There has recently been developed and widely used, particularly in the medical field, a radiation image recording and reproducing system for producing the radiation-transmitted image of an object using a stimulable phosphor material capable of emitting light upon exposure to stimulating rays. When a stimulable phosphor is exposed to radiation such as X-rays, α-rays, β-rays, γ-rays, cathode rays, or ultraviolet rays, the phosphor stores a part of the energy of the radiation. When the phosphor exposed to the radiation is subsequently exposed to stimulating rays such as visible light, the phosphor emits light in proportion to the stored energy of the radiation.

In the radiation image recording and reproducing system employing such a stimulable phosphor, the radiation image information of an object such as a human body is recorded on a sheet having a layer of stimulable phosphor, and then the stimulable phosphor sheet is scanned with stimulating rays such as a laser beam to cause the stimulable phosphor sheet to emit light representative of the radiation image. The emitted light is then photoelectrically detected to produce an image signal which is electrically processed to generate image information which is recorded on a recording medium such as a photographic photosensitive material or displayed as a visible image on a CRT or the like.

The visible image thus produced may be recorded on a recording medium by an image recorder such as an image output laser printer, for example. In the image output laser printer, photographic recording sheet films are stacked in a magazine, loaded, and taken out one by one by a sheet feeding mechanism including a suction cup or the like. Thereafter, the film is exposed to a laser beam modulated by an signal produced from the stimulable phosphor sheet for recording an image on the film. The exposed film is then transferred into an automatic developing device and processed thereby to develop the image. The film is thereafter stored in a prescribed place or directly used in medical diagnosis.

Films to be delivered by the sheet feeding mechanism are stacked in the magazine, and hence tend to stick to adjacent sheets due for example to static electricity. Therefore, when taking a film out of the magazine using the suction cup, one or more adjacent films are liable to stick to the film and hence a plurality of films are simultaneously fed from the magazine.

Japanese Laid-Open Paten Publication No. 56-132236 discloses a sheet feeding mechanism for taking films, one by one, out of magazine.

FIG. **1** of the accompanying drawings shows the disclosed sheet feeding mechanism, generally designated by the reference numeral **2**. The sheet feeding mechanism **2** includes a support member **4** through which five tubular bodies **6***a* through **6***e* extend for slidable movement. Suction cups **8***a* through **8***e* are mounted on the distal ends of the tubular bodies **6***a* through **6***e*, respectively, and stoppers **10***a* through **10***e* are fixed to the tubular bodies **6***a* through **6***e*, respectively, at positions spaced given distances from the suction cups **8***a* through **8***e*. The stoppers **10***a* through **10***e* are located on the respective tubular bodies **6***a* through **6***e* such that when the support member **4** is positioned parallel to a sheet stack A, the suction cups **8***a*, **8***e* are closest to the sheet stack A, the suction cup **8***c* is remote from the sheet stack A, and the suction cups **8***b*, **8***d* are positioned between the suction cups **8***a*, **8***e* and the suction cup **8***c*. Coil springs **12***a* through **12***e* are disposed under compression between the suction cups **8***a* through **8***e* and the support member **4**. The tubular bodies **6***a* through **6***e* are connected to a vacuum suction mechanism (not shown).

In operation, the support member **4** is displaced toward the sheet stack A until it reaches a position in which all of the suction cups **8***a* through **8***e* abut against the upper surface of an uppermost sheet **A1**. Then, the support member **4** is stopped, and the vacuum suction mechanism is actuated to cause the suction cups **8***a* through **8***e* to attract the sheet **A1**.

Then, the support member **4** is moved away from the sheet stack A. Upon such movement of the support member **4**, the stopper **10***c* fixed to the tubular body **6***c* is first brought into engagement with the support member **4** under the influence of the coil spring **12***c*, thus displacing the suction cup **8***c* upwardly in FIG. **1**. Therefore, a slight gap is created between the uppermost sheet **A1** and next adjacent sheet **A2**. As the support member **4** is further displaced upwardly, the stoppers **10***b*, **10***d* are then brought into engagement with the support member **4** by the bias forces of the coil springs **12***b*, **12***d* to move the suction cups **8***b*, **8***d* upwardly. Finally, the suction cups **8***a*, **8***e* are moved upwardly, and hence all of the suction cups **8***a* through **8***e* are displaced upwardly to deform the sheet **A1** in an upwardly curved shape as shown in FIG. **1**.

Consequently, a space is developed between the sheets **A1**, **A2**, so that the sheet **A2** will not be fed with the sheet **A1**. As a result, sheets can be fed one by one from the sheet stack A by the sheet feeding mechanism **2**.

With the conventional sheet feeding mechanism **2**, however, since the sheets are curved by the suction cups **8***a* through **8***e*, the lengths of the tubular bodies **6***a* through **6***e* on which the suction cups **8***a* through **8***e* are mounted, respectively, must be appropriately selected. More specifically, the tubular body **6***c*, the tubular bodies **6***b*, **6***d*, and the tubular bodies **6***a*, **6***e* have at least three respectively different lengths. This is disadvantageous in that the process of fabricating the tubular bodies is made more complex and costly. In addition, the tubular bodies must be associated with coil springs of different lengths, and it is also tedious and time-consuming to select suitable spring lengths, manufacture coil springs of such different lengths, and adjust the coil springs so as to best suited to the associated tubular bodies. Another drawback is that after the sheet **A1** has been fed from the sheet stack A, the sheet **A1** is held in the curved configuration, and, therefore, the feed path following the sheet feeding mechanism **2** should be of

such a structure as to be able to accommodate the curved sheet A1. The feed path of such a structure is, however, complicated.

SUMMARY OF THE INVENTION

It is a primary object of the present invention to provide a sheet feeding mechanism of a simple construction including tubular bodies of identical length and suction cups securely mounted on the arm member, and a guide member such as a bearing or bearings coupled to the arm member, the guide member being fitted in a groove defined in a guide plate and displaceable along the shape of the groove to swing the arm member at least once to sway a sheet held by the suction cups, so that stacked sheets can be reliably taken one by one out of a magazine.

Another object of the present invention is to provide a sheet feeding mechanism comprising suction means for holding and successively feeding stacked sheets, the suction means including a plurality of suction cups coupled via tubes to a vacuum suction device, an arm member on which the suction means is securely mounted, a guide member operatively engaging the arm member and fitted in a guide opening, and drive means actuatable for displacing the guide member along the shape of the guide opening to angularly move the arm member to thereby sway and feed a sheet held by the suction cups.

Still another object of the present invention is to provide a sheet feeding mechanism comprising suction means for holding and successively feeding stacked sheets, the suction means including a plurality of suction cups coupled via tubes to a vacuum suction device, an arm member on which the suction means is securely mounted, and a first fixed guide member and a second movable guide member for displacing the arm member along a prescribed path, the arrangement being such that when a sheet is held by the suction cups, the arm member is swingably displaceable by the second guide member to sway the sheet held by the suction cups.

The above and other objects, features and advantages of the present invention will become more apparent from the following description when taken in conjuction with the accompanying drawings in which preferred embodiments of the present invention are shown by way of illustrative example.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a schematic elevational view of a conventional sheet feeding mechanism;

FIG. **2** is a fragmentary perspective view of a sheet feeding mechanism according to the present invention;

FIGS. **3**(*a*), **3**(*b*), and **3**(*c*) are elevational views showing successive steps of operation of the sheet feeding mechanism of the invention;

FIG. **4** is a fragmentary perspective view of a sheet feeding mechanism according to another embodiment of the present invention;

FIGS. **5**(*a*) and **5**(*b*) are elevational views showing successive steps of operation of the sheet feeding mechanism illustrated in FIG. **4**;

FIG. **6** is a fragmentary perspective view of a sheet feeding mechanism according to still another embodiment of the present invention; and

FIGS. **7**(*a*), **7**(*b*), and **7**(*c*) are elevational views showing successive steps of operation of the sheet feeding mechanism illustrated in FIG. **6**.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Like or corresponding parts are denoted by like or corresponding reference characters throughout the several views.

As shown in FIG. **2**, a sheet feeding mechanism, generally denoted by the reference numeral **20**, according to the present invention includes a rotational drive source **22** such as an electric motor having a rotatable drive shaft **22a** supporting thereon a first sprocket **24**. A chain **26** is trained around the first sprocket **24** and a second sprocket **28** mounted on one end of a rotatable shaft **30**. The rotatable shaft **30** has its opposite ends fixed to ends of plate-like swing arms **34***a*, **34***b*, respectively, which engage sliders **36***a*, **36***b*, respectively.

A pair of attachment plates **38***a*, **38***b* vertically spaced from each other are attached to a support plate **37***a* erected in an image recording apparatus (not shown). To and between the attachement plates **38***a*, **38***b*, there is secured a pair of vertical guide bars **40***a*, **40***b* extending parallel to each other, the slider **36***a* being slidably supported on the guide bars **40***a*, **40***b*. A bearing **44** is rotatably supported by a support pin **42** on the slider **36***a*. The swing arm **34***a* has one end engaging the bearing **44**. The slider **36***a* has projections **46***a*, **46***b* on opposite sides thereof, with coil springs **48***a*, **48***b* coupled between the projections **46***a*, **46***b* and the attachement plate **38***b*. A pin **50** is mounted on the surface of the slider **36a** which is opposite to the support pin **42**.

The slider **36***b* is of a structure similar to that of the slider **36***a*. A pair of guide bars **40***c*, **40***d* is secured to and between two vertically spaced attachment plates **38***c*, **38***d* affixed to a support plate **37***b*, the slider **36***b* being slidably mounted on the guide bars **40***c*, **40***d*. A bearing **44***a* is rotatably mounted on one surface of the slider **36***b*, the bearing **44***a* engaging the swing arm **34***b*. Coil springs **48***c*, **48***d* are coupled between the attachment plate **38***d* and projections **46***c*, **46***d* on opposite sides of the slider **36***b*. A pin **52** is mounted on the surface of the slider **36***b* which is opposite to the bearing **44***a*.

A connector plate **54** is swingably coupled at one end to the pin **50**, and a coil spring **56** is coupled between the connector plate **54** and the slider **36***a*. The connector plate **54** is normally urged by the coil spring **56** to be angularly displaced in the direction of the arrow D. A fixed pin **58** is secured to the other end of the connector plate **54**. A bearing or rotatable member **60** is supported on the fixed pin **58** at its substantially intermediate portion and engages in a guide plate **62**.

The guide plate **62** is fixed to the support plate **37***a* and has a guide groove **64** in which the bearing **60** engages. The groove **64** includes a first opening **66***a* extending vertically upwardly to a prescribed length, a second opening curved to the right (FIG. **2**), and a third opening **66***c* inclined leftwardly and upwardly from an end of the second opening **66***b*. The second opening **66***b* may be of a bent shape as indicated by the broken line in FIG. **2**.

An arm member **70** engages the fixed pin **58** and the pin **52**. The arm member **70** has a first arm **72** secured to the fixed pin **58**, a second arm **74** swingably supported on the pin **52**, the first arm **72** being shorter than the second arm **74**, and a third arm **76** extending horizontally and integrally joined to the upper ends of the first and second arms **72**, **74**. A plurality of tubular bodies **78** extend through the third arm **76** in spaced relation to each other. The tubular bodies **78** are fixed to the third

arm **76** through respective engaging members **80** on the tubular bodies **78**. Suction cups **82** are mounted on ends of the tubular bodies **78**, respectively, which are coupled at the other ends to a vacuum suction device [(not shown).]

The operation and advantages of the sheet feeding mechanism of the above construction will be described below.

A process of taking out sheet films A, one by one, from a magazine **86** which contain a stack of such sheet films A will be described with reference to FIGS. **3**(*a*) through **3**(*c*).

The rotational drive source **22** is energized to rotate the drive shaft **22***a* about its own axis in the direction of the arrow B (FIG. **2**). The first sprocket **24** coupled to the drive shaft **22***a* rotated also in the direction of the arrow B to cause the chain **26** to rotate the second sprocket **28**. Therefore, the rotatable shaft **30** which supports the second sprocket **28** is also rotated to enable the swing arms **34***a*, **34***b* secured to the shaft **30** to swing in the direction of the arrow B. The sliders **36***a*, **36***b* engaging the swing arms **34***a*, **34***b*, respectively, are now displaced downwardly along the guide bars **40***a*, **40***b*, **40***c*, **40***d* under the bias of the coil springs **48***a*, **48***b*, **48***c*, **48***d*. The arm member **70** supported on the sliders **36***a*, **36***b* is thus displaced downwardly via the bearing **60** which is guided in the first opening **66***a* of the guide plate **62**. The suction cups **82** on the tubular bodies **78** mounted on the arm member **70** are brought into resilient pressing engagement with the upper surface of the uppermost sheet film **A1** stored in the magazine **86** through the use of the coil springs **48***a* through **48***d* (see FIG. **3**(a)).

Then, the vacuum suction device (FIG. **4**) is operated to enable the suction cups **82** to attract the sheet film **A1**, and the rotatable drive source **22** is rotated in the reverse direction. The drive shaft **22***a* is rotated about its own axis in the direction of the arrow C (FIG. **2**) to cause the first sprocket **24**, the chain **26**, and the second sprocket **28** to rotate the shaft **30** in the direction of the arrow C, whereupon the swing arms **34***a*, **34***b* fixed to the shaft **30** are swung in the direction of the arrow C. Consequently, the sliders **36***a***36***b* engaging the swing arms **34***a*, **34***b*, respectively, are moved upwardly against the bias of the coil springs **48***a*, **48***b*, **48***c*, **48***d*, so that the arm member **70** is also moved upwardly through the bearing **60** guided in the first opening **66***a* of the groove **64**. The suction cups **82** are lifted upwardly to take one end of the sheet film **A1** out of the magazine **86**.

The rotational drive source **22** is further actuated to displace the sliders **36***a*, **36***b* upwardly until the bearing **60** reaches the second opening **66***b* of the groove **64**. Since the connector plate **54** is resiliently biased in the direction of the arrow D (FIG. **2**) by the tension of the coil spring **56**, the connector plate **54** is angularly moved about the pin **50** in the direction of the arrow D, whereupon the bearing **60** supported on the connector plate **54** by the fixed pin **58** is displaced along the curved edge of the second opening **66***b*. As a result, the arm member **70** affixed to the connector plate **54** by the fixed pin **58** is also tilted or angularly moved in the direction of the arrow D. At this time, as shown in FIG. **3**(*b*), the suction cups **82** on the arm member **70** are angularly displaced to sway the sheet film **A1** held by the suction cups **82**. The next sheet film **A2** which may have also been taken out of the magazine **86** in intimate contact with the sheet film **A1** due for example to static electricity is now separated from the sheet film A and drops back into the magazine **86**.

Continued energization of the rotational drive source **22** to displace the sliders **36***a*, **36***b* upwardly moves the bearing **60** out of the second opening **66***b* into the third opening **66***c*. The arm member **70** is angularly moved in the opposite direction of the arrow B (FIG. **3**(c)) to position a leading end of the sheet film **A1** held by the suction cups **82** between a pair of delivery rollers **88***a*, **88***b* held in rolling contact with each other. The rollers **88***a*, **88***b* are then rotated, and at the same time the vacuum suction device is activated, whereupon the sheet film **A1** is sandwiched between the rollers **88***a*, **88***b* and delivered thereby into an image recording section (not shown).

Thereafter, the rotational drive source **22** is driven to rotate the drive shaft **22***a* in the direction of the arrow B (FIG. **2**) to lower the sliders **36***a*, **36***b* to pick up the next sheet out of the magazine **88** by the same process as described above.

While in the above embodiment the guide plate **62** is composed of a single plate as shown in FIG. **2**, the guide plate **62** may comprise a plurality of bent or curved plates as indicated by the dot-and-dash lines in FIG. **2** to faciliate the formation of the openings **66***a* through **66***c*. The configuration of the groove **64** may suitably be selected dependent on the direction in which the films A from the magazine **86** should be swayed or the position of the delivery rollers **88***a*, **88***b*.

A sheet feeding mechanism according to another embodiment of the present invention will be described hereinbelow with reference to FIGS. **4** and **5**(*a*) and **5**(*b*).

A sheet feeding mechanism **20***a* includes a first connector plate **90** of a relatively large length swingably supported on the slider **36***a* by the pin **50** and the coil spring **56**. A bearing **94***a* is supported on one end of the connector plate **90** by a fixed pin **92**, whereas a shorter connector plate **98** is swingably supported on the other end of the connector plate **90** by means of a pin **96**. The connector plate **98** has one end to which there is secured a fixed pin **100** supporting a bearing **94***b* thereon. The first arm **72** of the arm member **70** is coupled to an end of the fixed pin **100**, and the second arm **74** of the arm member **70** is swingably coupled to the other slider **36***b*. More specifically, the slider **36***b* has a pin **50***a* by which a long connector plate **90***a* is swingably supported at one end on the slider **36***b*. The other end of the connector plate **90***a* is joined to a pin **96***a* which supports the second arm **74**.

A stopper pin **102** is fixed to a lower end portion of the connector plate **90**, with a coil spring **104** coupled between the stopper pin **102** and the connector plate **98**.

A guide groove **64***a* is defined by two guide plates **62***a*, **62***b*. The guide groove **64***a* extends upwardly from an open lower end thereof and includes a first curved portion **106***a* located above the lower end and curved to the right (FIG. **4**) and a second curved portion **106***b* located above the first curved portion **106***a* and curved upwardly to the left. The guide groove **64***a* has a substantially central portion opening laterally through a wide opening **108** defined between the guide plates **62***a*, **62***b*.

In operation, the rotatable drive source **22** is actuated to displace the arm member **70** downwardly through the sliders **36***a*, **36***b* to thereby press the suction cups **82** against the sheet film A to attract the same. In the subsequent upward movement, after the sheet film A has

been swayed by angular movement of the suction cups **82**, it is tilted so as to be directed toward the delivery rollers **88***a*, **88***b* (FIG. **5**(*b*)), by which the sheet film A will be fed into the image recording section.

In the sheet feeding mechanism **20***a* of the second embodiment, as shown in FIGS. **5**(*a*) and **5**(*b*), the bearings **94***a*, **94***b* sway the sheet film A and feed the same to the rollers **88***a*, **88***b* in independent processes.

More specifically, the arm member **70** is displaced upwardly by energizing the rotational drive source **22**. First, the bearing **94***b* is fitted into the first curved portion **106***a* to tilt the arm member **70** to curve and sway the sheet film A held by the suction cups **82**, as shown in FIG. **5**(*a*). Upon further upward movement of the arm member **70**, the bearing **94***a* is shifted into the second curved portion **106***b*. At this time, the stopper pin **102** affixed to the connector plate **90** engages the connector plate **98** to tilt the arm member **70** in alignment with the connector plate **90**. The sheet film A held by the suction cups **82** now has its leading end tilted so as to be directed toward the delivery rollers **88***a*, **88***b* (FIG. (*b*)). At this time, the bearing **94***b* enters the opening **108** to allow the arm member **70** to swing as desired. The vacuum suction device is de-activated to release the sheet film A, and the delivery rollers **88***a*, **88***b* are rotated to sandwich and deliver the sheet film A into the image recording section.

FIG. **6** shows a sheet feeding mechanism according to still another embodiment of the present invention. In this embodiment, the guide plates **62** of the first embodiment or the guide plates **62***a*, **62***b* of the second embodiment are replaced by a guide plate or member **200**.

The guide plate **200** is of an inverted L shape with a wider upper portion having a guide groove **202** defined therein. The guide groove **202** has an open lower end and is defined between wall surfaces **204***a*, **204***b* extending downwardly. The guide groove **202** has an opening **206** defined in its upper end and curved upwardly to the left.

A guide plate or member **208** is angularly movably mounted on a lower portion of the guide plate **200** by a pivot pin **210**. The guide plate **208** has a curved portion **212** which can project rightwardly from the wall surface **204***b* by a prescribed distance. The guide plate **208** also has a vertically extending engaging finger **214** at an end remote from the curved portion **212**. A resilient member **216** such as a coil spring has one end fixed to the guide plate **208** and the other end to the guide plate **200**. A stopper pin **218** is mounted on the guide plate **200** adjacent to the guide plate **208**. The guide plate **208** is normally urged by the tension of the coil spring **216** so as to be positioned by the stopper pin **218** as shown in FIG. **6**. the coil spring **216** is not required to have a substantially large tensioning force, but may have a tensioning force large enough to keep the distal end of the curved portion **212** of the guide plate **208** in touch with the stopper pin **218**.

The arm member **70** is displaced downwardly upon energization of the rotational drive source **22** while the bearing **94***a* is held in rolling contact with the wall surface **204***a* of the guide plate **200**.

As the bearing **94***a* is moved downwardly, the bearing **94***b* is brought into engagement with the curved portion **212** of the guide plate **208**. The guide plate **208** is now turned in the direction of the arrow F against the tension of the coil spring **216**, so that the curved portion **212** is angularly displaced inwardly of the wall surface **204***b*, allowing the bearing **94***b* to descend along the wall surface **204***b*, as shown in FIG. **7**(*a*). At this time, the engaging finger **214** of the guide plate **208** engages the stopper pin **218** to prevent the guide plate **208** from swinging excessively in the direction of the arrow F. After the bearing **94***b* has moved downwardly past the guide plate **208**, the guide plate **208** springs back to the position of FIG. **6** in which the distal end of the curved portion **212** is held against the stopper pin **218** by the tension of the coil spring **216**.

The vacuum suction device (not shown in FIG. **6**) is then actuated to enable the suction cups **82** to hold the uppermost sheet film A in a magazine **104**, after which the rotational drive source **22** is reversed. The sliders **36***a*, **36***b* are moved upwardly to cause the bearing **94***b* to abut against the guide plate **208** which is positioned by the stopper pin **218** under the bias of the coil spring **216**.

Since the guide plate **208** is held by the stopper pin **218** against rotation in the direction of the arrow H, the bearing **94***b* rides onto and is moved along the curved edge of the curved portion **212** against the tension of the coil spring **104**, as shown in FIG. **7**(*b*). As a result, the arm member **70** is tilted to curve and sway the sheet film A held by the suction cups **82**, thus releasing any other film or films which may have stuck to the sheet film A in the magazine **104**.

The arm member **70** is continuously moved upwardly to bring the bearing **94***a* into the opening **206** to thereby swing the connector plate **90** against the bias of the coil spring **56**. The stopper pin **102** fixed to the connector plate **90** engages the connector plate **98** to tilt the arm member **70** in alignment with the connector plate **90**. Thus, the sheet film A held by the suction cups **82** is also tilted to direct its leading end toward delivery rollers **106***a*, **106***b*, as shown in FIG. **7**(*c*). Upon de-energization of the vacuum suction device and rotation of the delivery rollers **106***a*, **106***b*, the sheet film A is sandwiched by the delivery rollers **106***a*, **106***b* and fed thereby into the image recording section (not shown).

With the present invention, as described above, identical suction cups and identical tubular bodies are securely mounted on the arm member, and the arm member is displaced by a guide member including a bearing or bearings fitted in and guided by a curved or bent guide groove to sway a sheet member held by the suction cups and thereby feed the sheet member. Even if stacked sheets stored in the magazine stick together due for example to static electricity, the sheets can be reliably separated and fed one by one from the magazine to the next processing step. The configuration of the guide groove in which the guide member is fitted may be suitably selected to vary the manner in which the sheet is taken out of the magazine. Therefore, stacked sheets can be fed one by one from a magazine even when the magazine is placed in a different postion or posture in the image recorder or the like.

The sheet feeding mechanism of the present invention may be employed to remove stimulable phosphor sheets, one by one, stacked in a radiation image recording or reading apparatus which constitutes a radiation image recording and reproducing system.

Although certain preferred embodiments have been shown and described, it should be understood that many changes and modifications may be made therein without departing from the scope of the appended claims.

What is claimed is:

1. A sheet feeding mechanism comprising:

suction means for holding and successively feeding sheets, said suction means including a plurality of suction elements coupled to a vacuum suction device;

an arm member on which said suction means is mounted;

a guide member operatively engaging said arm member and fitted in a guide opening having an at least partially non-linear profile; and

means for displacing said guide member so that said guide member and said arm member follow said profile of said guide opening, said profile having at least two portions for angularly moving said arm member to sway and subsequently feed a sheet held by said suction elements as said guide member is moved along said guide opening.

2. A sheet feeding mechanism according to claim 1, wherein said arm member is swingably supported on a slider comprising a part of said drive means, said guide member comprising a rotatable member coupled to said arm member, said guide opening being defined in at least one guide plate, at least one of said portions being curved or bent, said rotatable member being fittable in said curved or bent portion during reciprocating movement of said slider upon operation of said drive means for angularly moving said arm member with respect to said slider to sway the sheet held by said suction means.

3. A sheet feeding mechanism according to claim 2, wherein said first and second portion are curved portions, said rotatable member being fittable in said first curved portion to swing said arm member to sway the sheet held by said suction means to prevent a plurality of sheets from being fed simultaneously, and said rotatable member being subsequently fittable in said second curved portion to swing said arm member to tilt an end of said sheet toward a nip between a pair of delivery rollers.

4. A sheet feeding mechanism according to claim 2, said drive means further including connector plate means swingably supported on said slider, said guide opening having first and second portions being curved portions, said guide member comprising a first rotatable member mounted on one end of said connector plate means, and a second rotatable member, said arm member and said second rotatable member being mounted at the other end of said connector plate means for swinging movement in one direction, said second rotatable member being fittable in said first curved portion to swing said arm member to sway the sheet held by said suction cups to prevent simultaneous feeding of a plurality of sheets, said first rotatable member being fittable in said second curved portion to swing said connector plate means and said arm member in unison to tilt an end of said sheet toward a nip between a pair of delivery rollers.

5. A sheet feeding mechanism comprising:

suction means for holding and successively feeding stacked sheets, said suction means including a plurality of suction elements coupled to a vacuum suction device;

an arm member on which said suction means is mounted; and

a first fixed guide member and a second movable guide member for controlling movement of said arm member along respective distinct portions of a prescribed path; such second guide member including profile means for swingably displacing said arm member to sway a sheet held by said suction elements when said arm member traverses a first prescribed portion of said path.

6. A sheet feeding mechanism according to claim 5, wherein said second guide member is angularly movably supported on said first guide member and biased toward a first angular portion, said second guide member having a contour extending beyond a contoured surface of said first guide member for swinging said arm member, said second guide member being angularly moved by said arm member against said bias to allow said arm member to be moved along said first guide member when said arm member moves toward said stacked sheets, and said arm member being swingably displaced along said contour of said second guide member to sway said sheet when said arm member is moved away from said stacked sheets.

7. A sheet feeding mechanism according to claim 6, further including a stopper pin mounted on said first guide member, said second guide member being biased into engagement with said stopper pin said second guide member being prevented by said stopper pin from being angularly moved when said arm member is being swingably displaced along said contour.

8. A sheet feeding mechanism according to claim 7, wherein said second guide member includes an engaging finger, said engaging finger being engageable with said stopper pin to limit angular movement of said second guide member when said arm member angularly moves said second guide member upon displacement toward said stacked sheets.

9. A sheet feeding mechanism according to claim 5, wherein said first guide member includes a curved or bent portion defining a second prescribed portion of said path, said arm member being swingably displaced by said curved or bent portion when being moved along said second prescribed portion of said path, to tilt an end of said sheet toward a nip between a pair of delivery rollers.

10. A sheet feeding mechanism according to claim 5, further including a rotatable member mounted on said arm member, means for resiliently urging said rotatable member into rolling contact with guide surfaces of said first and second guide members, and means for reciprocally displacing said arm member to displace said rotatable member along said guide surfaces.

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